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Day 23 is Thursday, October 18, 2012

Introduce the second derivative

Symbols

Without variables

$f''$

$D^2 f$

With variables

$f''(x)$ ,  $D^2 f(x)$

,  $\frac{d^2 f(x)}{dx^2}$

Meaning

The derivative of the derivative of  $f(x)$ .

That is  $f''(x) = \frac{d}{dx} (f'(x)) = \frac{d}{dx} \left( \frac{df(x)}{dx} \right)$

Recall Correspondence between 2<sup>nd</sup> Derivative and Concavity  
(in Reference 8 in Course Packet)

# Define inflection point

words:  $x=c$  is an inflection point for  $f$ .

## Meaning

The  $x$ -value  $x=c$  passes these two tests

- $f(c)$  exists. (That is, there is a point on the graph at  $x=c$ )
- $f$  changes concavity at  $x=c$ .  
(that will require that  $f''$  change sign at  $x=c$ .)

## Three examples involving analyzing functions.

In each example, we will be given ~~a~~  
a formula for a function.

We will answer six questions.

- (A) Find intervals where function is increasing/decreasing/horizontal
- (B) Find x-coordinates of local max & mins
- (C) Find y-coordinates of local max & mins
- (D) Find intervals where function is concave up or down
- (E) Find x-coordinates of inflection points
- (F) Find y-coordinates of inflection points.

